

DEMOGRAPHIC AND CLINICAL FEATURES WITH SURGICAL CONSIDERATIONS IN ADULT CRANIOPHARYNGIOMAS: A ROMANIAN NEUROSURGICAL CENTER EXPERIENCE

Ana-Marina Rădulescu¹, Anca Sava^{1,2}, Ana-Maria Dumitrescu^{1*}, L. Eva^{2,3},
Gabriela Florența Dumitrescu², D. Rotariu^{1,2}, Veronica Scripcaru^{1,2}, A. D. Chiran¹, C. I. Stan¹

1. Grigore T. Popa University of Medicine and Pharmacy Iasi, Romania

2. Prof. Dr. N. Oblu Emergency Clinical Hospital, Iasi, Romania

3. Dunărea de Jos University Galați, Romania

*Corresponding author. E-mail: anna.dumitrescu91@gmail.com

DEMOGRAPHIC AND CLINICAL FEATURES WITH SURGICAL CONSIDERATIONS IN ADULT CRANIOPHARYNGIOMAS: A ROMANIAN NEUROSURGICAL CENTER EXPERIENCE (Abstract): Craniopharyngiomas (CPs) are rare benign epithelial tumors of the sellar-suprasellar region that remain surgically challenging. **Aim:** To evaluate the clinical, imaging, pathological and surgical aspects of CPs diagnosed in adult patients as such previous analyses are rare. **Materials and methods:** We performed a retrospective study that included adult patients (≥ 18 years) with surgically treated and pathologically confirmed CP between January 2016 and December 2021. Eligible cases were analyzed regarding demographic data, clinical presentation, and surgical approach. **Results:** Eleven adult patients were included (mean age 46.6 ± 12.6 years), with a slight female predominance (54.5%). Two peaks in patients' age were noted: one in the fifth decade of life (40- to 49-year-olds) and another in the seventh decade of life (60- to 69-year-olds). Visual disturbances were the most frequent presenting symptom (81.8%), but headache (54.5%), endocrine dysfunctions (36.36%), and neurocognitive symptoms (27.3%) were also identified. Open craniotomy was performed in 72.7% of cases, while extended endoscopic endonasal approach was realized in the rest of the cases. Subtotal resection was achieved in 63.6% of all cases. **Conclusions:** The findings of our study align with published data, while highlighting specific diagnostic peculiarities in Romanian adult patients with craniopharyngiomas. **Keywords:** CRANIOPHARYNGIOMA; ADULT PATIENTS; VISUAL DISTURBANCES; SURGICAL APPROACH.

INTRODUCTION

Craniopharyngiomas (CPs) are rare intracranial epithelial tumors that develop from remnants of Rathke's pouch due to errors occurring in the process of differentiation during embryogenesis (1).

Even though, from a histologically point of view, CP was first described more than a century and a half ago and the first success-

ful surgical resection of such a tumor was performed at the beginning of the 20th century (2,3), this entity is still considered "a challenging tumor of the sella" (4) due to its proximity to vital neurovascular structures and the difficulties in surgical interventions when surgeons try to reach the tumor.

Although both 2021 WHO 5th edition of Classification of CNS tumors (5) and the

Demographic and Clinical Features with Surgical Considerations in Adult Craniopharyngiomas: A Romanian Neurosurgical Center Experience

latest 2025 WHO 5th edition Classification of Endocrine Tumors (6) assign grade 1 malignancy to craniopharyngioma, this tumor is associated with varied clinical manifestations, elevated recurrence, long-term postsurgical comorbidities, but also with a high risk of mortality (7-10).

In the United States, the incidence of pathologic-confirmed CP was 0.16 per 100,000 persons. This tumor has a bimodal distribution, with two peaks, one in childhood (5- to 9-year-olds) and another in adults (55 - to 69-year-olds) (1).

In adults, these tumors account for 1-3% of all primary intracranial tumors (11), but it is believed that the incidence could increase in the coming period due to widespread use of cranio-cerebral computed tomography (CT) and Magnetic Resonance Imaging (MRI) whenever a neurological or endocrinological symptoms appear (12).

In recent years, comprehensive studies on the demographic, clinical, imaging, pathological and surgical aspects of CPs are mostly review-type (11, 13-15), and those based on case series are quite rare, often analyzing a very small number of patients (16, 17). In addition, reports on CPs identified in children (12, 18, 19) are more numerous than those dedicated to craniopharyngioma diagnosed in adults (20) or studies that include both pediatric and adult patients (21).

Considering that some differences in tumor biology, clinical presentation and functional outcomes have been reported depending on age (22), in the present study, we performed a retrospective analysis of CPs diagnosed in adult patients and treated in the Prof. Dr. N. Oblu Clinical Emergency Hospital in Iași, Romania, which is a tertiary care center with a reference area of

approximately 5 million inhabitants. The aim of this study was to evaluate the clinical, imaging, pathological and surgical aspects of CPs diagnosed and treated in this health institution in adult patients and to compare these data with data from similar studies in the literature, as such previous analyses are rare. Such data may provide a new perspective on this disease in adults, providing useful information for future treatments.

MATERIALS AND METHODS

The study was approved by the Ethic Committee of Prof. Dr. N. Oblu Emergency Clinical Hospital, Iași, Romania (No. 1333/January 1st, 2023), as a quality control study. Informed consent was obtained from all patients included in this study.

A retrospective study of patients who underwent surgical intervention for CP for a period of 6 years (January 1, 2016 and December 31, 2021) in the Department of Neurosurgery, Prof. Dr. N. Oblu Emergency Clinical Hospital, Iași, Romania, was performed.

The inclusion criteria were as follows: (1) adult patients (aged 18 years and older) admitted in any Neurosurgery Departments during the study period within the Hospital and having pathologically confirmed diagnosis of a CP; (2) all clinical, imaging, pathological and surgical data available.

The exclusion criteria were as follows: (1) Pediatric patients (aged less than 18 years) admitted in any Neurosurgery Departments during the study period within the Hospital and having pathologically confirmed diagnosis of a CP; (2) absence of informed consent; (3) unavailability of relevant clinical data; (4) previous resection or radiotherapy for their CP.

Over the analyzed period, searching in

the hospital database identified 18 patients with pathologically confirmed CP. Seven patients were excluded after meticulous scrutiny based on exclusion criteria. Finally, 11 patients were found eligible for further analysis.

For these 11 patients, data were collected from medical records and included: patients' demographic data (gender and age), presenting symptoms at admission, tumor location identified on magnetic resonance imaging (MRI), as well as type of the surgery (transcranial approach *vs.* endonasal approach) and extent of tumor resection (total *vs.* subtotal).

The information was collected using a data collection sheet. Due to the small sample size, all correlations were analyzed descriptively; some values were reported as a number, or as a number and percentage, while others as a mean \pm SD value or as a median value.

RESULTS

In 6 years, 11 adult patients with CP met the inclusion criteria for the present study. Their mean age at diagnosis was 46.6 ± 12.6 years (range 23-64), with a median age of 46 years. There was a slight female predominance (54.5%), the female-to-male ratio being 1.2: 1.

In the present series, the presence of two peaks in the identification of craniopharyngioma is noted: one in the fifth decade of life (40- to 49-year-olds) and another in the seventh decade of life (60- to 69-year-olds) (fig. 1).

Because symptom reporting was heterogeneous, all of them were coded into standardized categories based on narrative descriptions (tab. I). Visual disturbances were the predominant presenting symptom, observed in 81.8% of all cases, including blindness, visual field defects, and decreased visual acuity.

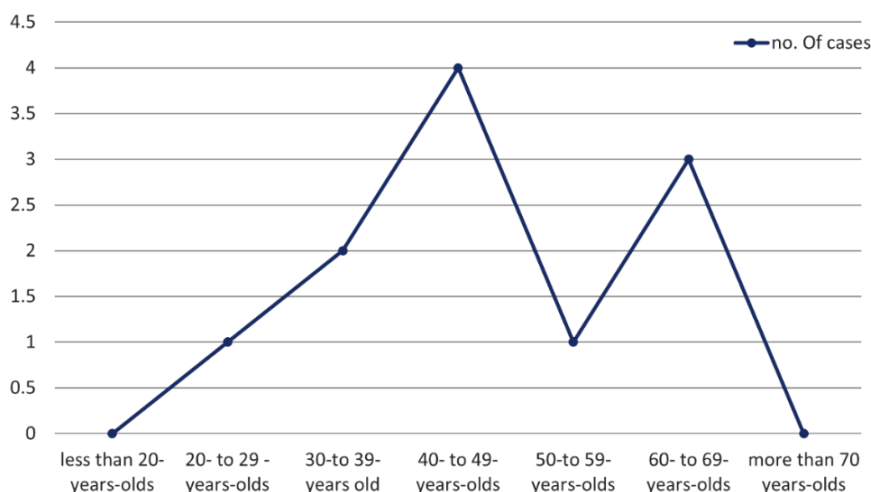


Fig. 1. Craniopharyngiomas distribution along the life decades in the study cohort.

Headache was reported by 54.5% of all patients, while endocrine dysfunction was

identified in 36.36% of all cases, diabetes insipidus being documented in 18.2% of all

**Demographic and Clinical Features with Surgical Considerations
in Adult Craniopharyngiomas: A Romanian Neurosurgical Center Experience**

cases. 27.3% of all cases exhibited neurocognitive symptoms such as confusion, or somnolence.

MRI tumor evaluation for CP location (tab. II) demonstrated a predominant suprasellar involvement, either isolated or combined with sellar extension (5/11 cases; 45.45%). Development of a CP in peri mesencephalic cistern was observed in a minority of cases (9.1%). Also, pure third ventricle (V3) location was rare (9.1%). Suprasellar tumor development with V3

extension was identified in 18.2% of cases. Prepontine tumor extension was recorded in 9.1% of cases. Wide tumor extension (prepontine and into the Sylvian fissure) was also identified in only 9.1% of cases.

Surgical resection (tab. III) was performed through open craniotomy in 8 cases (72.7%) (fig. 2) and by extended endoscopic endonasal approach in 3 cases (27.3%) (fig. 3). Gross total resection was achieved in 4 cases (36.4%) subtotal resection in 7 cases (63.6%).

TABLE I.
Clinical characteristics of the study cohort

MAIN PRESENTING SYMPTOMS	n	(%)
Visual disturbances (blindness, visual field defects, decreased visual acuity)	9	81.8%
Headache	6	54.5%
Endocrine dysfunction	4	36.36%
• Diabetes insipidus	2	18.2%
• Pituitary FSH and LH deficiency	1	9.1%
• Pituitary GH and ACTH deficiency	1	9.1%
Neurocognitive symptoms (confusion, somnolence)	3	27.3%

TABLE II.
Craniopharyngioma locations identified on MRI scans

TUMOR LOCATION (MRI)	n	%
Exclusive development in suprasellar region	2	18.2%
Exclusive development in peri mesencephalic cistern	1	9.1%
Exclusive development in the V3	1	9.1%
Sellar and suprasellar development	3	27.3%
Suprasellar development with V3 extension	2	18.2%
Suprasellar development with prepontine extension	1	9.1%
Sellar and suprasellar development, with prepontine and Sylvian fissure extensions	1	9.1%

TABLE III.

Surgical management of patients with craniopharyngiomas, including type of surgical approach and extent of tumor resection in the present series (n = 11).

SURGICAL VARIABLE	n	(%)
Types of surgical approach		
• Extended endoscopic endonasal approach	3	27.3%
• Open craniotomy	8	72.7%
○ Trans callosal / trans ventricular approach	4	36.4%
○ Fronto-temporal/ pteryonal approach	4	36.4%
Extent of tumor resection		
• Gross total resection (macroscopic)	4	36.4%
• Subtotal resection	7	63.6%

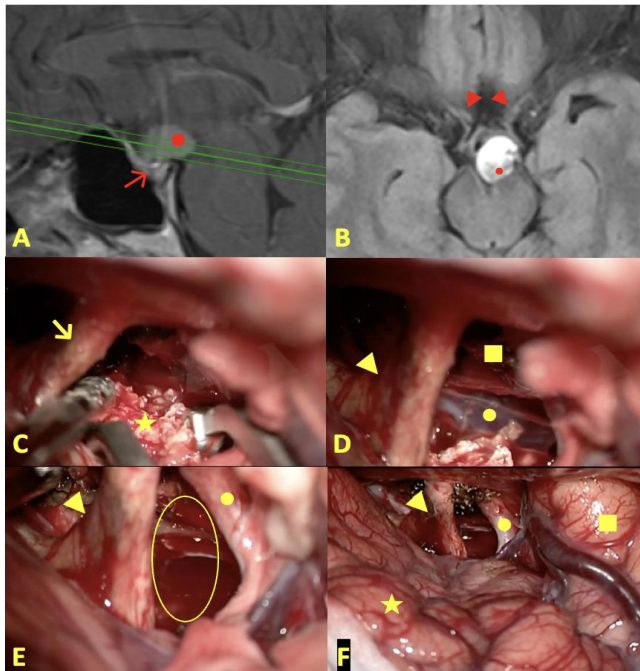


Fig 2. A) and B) images - preoperative MRI showing a suprasellar lesion with contrast enhancement (circle), the normal pituitary gland (arrow) and the optic nerves (arrow head) and a calcified portion (circle). C) To F) images: intraoperative pteryonal approach - showing on C) - the optic nerve (arrow) and the calcified portion of the lesion (star), D) - optic nerve and the optic chiasm (arrowhead), the pituitary gland (square) and the Lilliquist membrane (circle), E) - intraoperative aspect after tumoral resection showing the optic nerve (arrow head) right carotid artery (circle) and the optical-carotid window (oval); F) - same image at lower magnification.

**Demographic and Clinical Features with Surgical Considerations
in Adult Craniopharyngiomas: A Romanian Neurosurgical Center Experience**

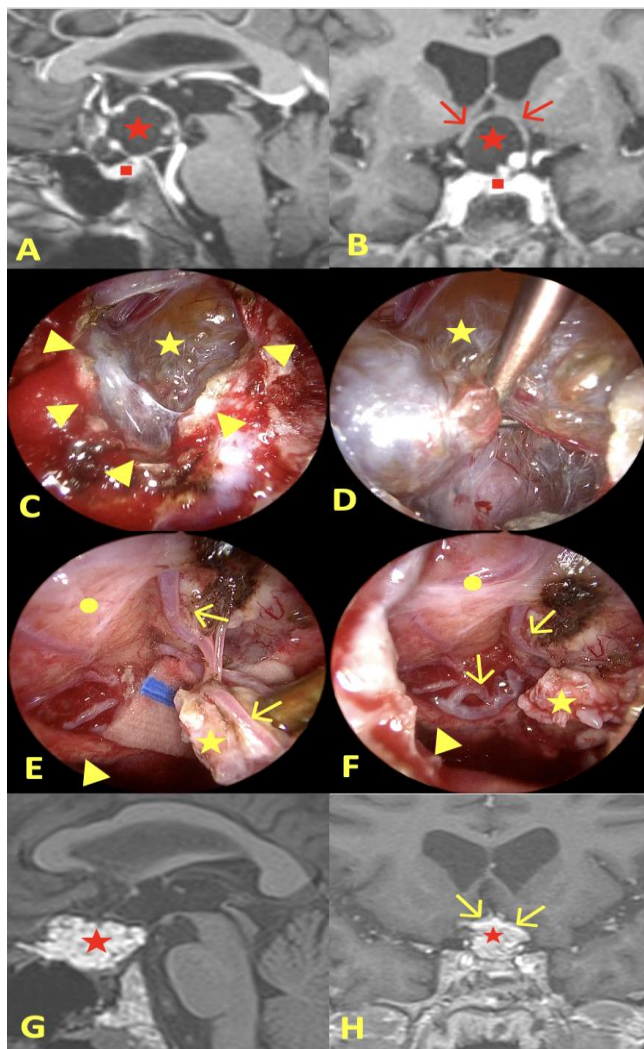


Fig 3. A and B MRI with contrast enhancement showing a cystic suprasellar lesion (star) the superior displacement of the optic chiasm (arrows) and the normal pituitary gland at the level of the sella (square). C-F intraoperative images (extended endoscopic transsphenoidal approach): C - at the level of the sphenoid sinus showing the opening of the dura (arrow heads) with exposing of the lesion (star), D - closer view of the tumor, E - intraoperative aspect after partial resection showing the tumor capsule (star) with close adhesion to the A2 segment of anterior cerebral artery (ACA) (arrow), the right optic nerve (arrow head), and the right basal frontal lobe (circle), F - final step of the resection showing the right optic nerve (arrowhead), the particular anatomic conformation (fenestration) of the anterior communicating complex (arrow) and a small tumor capsule remnant on the A2 segment of left ACA (star). G-H postoperative MRI showing the reconstruction of the skull base with fat plug (star), and the anatomic integrity of the anterior communicating complex (arrows).

DISCUSSION

Craniopharyngiomas diagnosis and management remain challenging because of their complex anatomy, heterogeneous imaging appearance, and frequent overlap with other sellar and suprasellar lesions (23).

The literature reports that CP has a bimodal age distribution with two peaks: one at age 5-14 years and the second at age 45-74 years (24), which may suggest the influence of certain underlying biological or environmental factors that contribute to the age-related incidence of the disease (25).

The present cohort, made up of adult patients (≥ 18 years old), included predominantly middle-aged adults (mean age 46.6 years) with a slight female predominance. Our data are different from those reported by others who found a slightly male predilection (26) or, more recently, no gender predilection (11). The demographic profile of the present cohort is also different from those reporting only one peak of CP incidence in adult patients, either in age group 40-44 years (26, 27) or 45-74 years (24). We found a small shift from the reported data because we identified two separate peaks (at 40-to 49 years-old and at 60- to 69-years-old). These new data can signify a change in tumor biology or a particularity for our study group.

From a clinical perspective, CP presentation in adults is often insidious with many and various symptoms that can be difficult for patients as well as for clinicians to identify early (16). Because CPs develop in close proximity to vital structures (optic pathways, hypothalamus, thalamus, brain stem), their clinical spectrum includes endocrine, visual, and neurological impairment, as well as hypothalamic syndrome and increased intracranial pres-

sure syndrome (23, 28).

The high prevalence of visual disturbances in our cohort (81.8%) closely mirrors reported rates ranging from 60% to over 84% in adult and mixed populations (10, 27) reflecting the frequent suprasellar extension and optic chiasm compression characteristic of CPs (25). However, visual symptoms are common to multiple other sellar region tumors and therefore lack discriminatory value.

The identification of visual disturbances in a high percentage in the present series also reflects the fact that the patients presented late to the neurosurgeon when CP already developed as a bulky tumor, with wide extension into neighboring structures, including the optic chiasm and hypothalamus.

Increased intracranial pressure due to voluminous tumor itself or to the hydrocephalus resulting from compression of V3 determine headache, which can occur in 35% - 68% of cases (10, 27). In the present study, the identified value for headache falls between these values, which demonstrates that even though the cohort was small, the data obtained are correct and align with those reported by authors from other countries. Also, in the present cohort, the frequent association with headache and hydrocephalus further emphasizes the mass effect exerted by these lesions, particularly in tumors with intraventricular extension.

Compression of the pituitary gland by any lesion cause anterior pituitary dysfunction with variable deficiencies of Growth Hormone (GH), gonadotropins [Follicle-Stimulating Hormone (FSH) and Luteinizing Hormone (LH)], Adrenocorticotrophic Hormone (ACTH), or Thyroid Stimulating Hormone (TSH). The literature reported that the most common deficiency encoun-

Demographic and Clinical Features with Surgical Considerations in Adult Craniopharyngiomas: A Romanian Neurosurgical Center Experience

tered in CPs are those of GH (86% of cases) (27), gonadotropins (40%), ACTH (25%), and TSH (25%) (25). Compression of the pituitary stalk and/or hypothalamus, determine hypothalamic-pituitary dysfunction with vasopressin deficiency manifesting as diabetes insipidus that appear in 17-38% of cases (25, 27). In the present cohort, adult patients with CPs also presented at admission some endocrine dysfunction, but the percentages are much lower than those reported by other authors, probably because they were not properly investigated preoperatively given the diagnostic error upon admission to the hospital.

Cognitive deficits (such as impaired memory, attention, and reduced processing speed), or sleep disorders (somnolence) appear in 17% to 71.5% of CP patients, especially in those with voluminous tumors that compress the hypothalamus (16, 29). The values obtain in the present series align with these reported percentages.

CPs have exceedingly a heterogeneous topography because these tumors may arise anywhere on the path of embryonic cell migration (7). Most CPs are located in the sellar and parasellar regions (23), an aspect also identified in the present series.

CPs can extend in all the directions: superior, inferior, lateral, anterior and posterior. MRI plays a pivotal role in evaluating the complex patterns of extension of CPs and their relationship with adjacent neurovascular structures.

These tumors may extend superiorly from the suprasellar region with compression of the third or lateral ventricles, laterally into parasellar regions and cavernous sinuses, anteriorly toward the frontal lobes with displacement of the anterior cerebral arteries, or posteriorly into the peri mesencephalic cisterns, brainstem, and cerebellar

spaces. Inferior extension to the sellar region, paranasal sinuses and nasopharynx may also be observed.

Accurate identification of these extension patterns is essential for surgical planning, guiding the choice between total and subtotal resection, and for differentiating craniopharyngiomas from other extensive skull-base lesions (30).

The tumor can also develop in the V3, either within the neural tissue of the infundibulum and tuber cinereum, which are components of V3, or strictly in V3, originating in its subependymal area (31). However, the incidence of purely intraventricular CPs accounts for 0.5 to 11% of all cases, as we also found in the present study. Most important is the fact that CPs located in V3 pose surgical challenges because of the complex and vital surrounding structures, including the hypothalamus, infundibulum, optic pathways, limbic system, and nearby vasculature (32).

Ectopic locations of CP have also been identified in adults, but they are extremely rare, published only as isolated case reports. As far as we know, CP location in the prepontine cistern, a situation in which there is no sellar involvement or endocrine dysfunction (33), in the temporal lobe with no connection to the craniopharyngeal duct (34), the nasopharynx, the posterior fossa, and the spine (7), or orbit (35) have been reported.

Although limited in terms of the small number of cases, two of these ectopic locations of the CP were also identified in the present series, namely in V3 and the perimesencephalic cistern, which, prior to the pathological diagnoses, determined an erroneous imaging diagnosis and a real surgical challenge.

Surgical management remains the cor-

nerstone of CP treatment. The choice of the type of surgical approach is adapted to each individual case, but also in correlation with the equipment of each hospital and the presence of at least one neurosurgeon specialized in such surgical interventions. The goal of a quality surgical intervention is to achieve a radical resection while minimizing damage to the surrounding vital neurovascular structures, especially the hypothalamus (21).

In the present series, surgical treatment was performed predominantly through open craniotomy approaches, reflecting frequent large tumor extension into the surrounding neuroanatomical structures, while endoscopic endonasal surgery was reserved for selected midline lesions.

Recent literature has reported increasing use of endoscopic endonasal approaches in selected midline lesions; however, these approaches are generally reserved for tumors with favorable anatomy and limited lateral or ventricular extension, offering a direct midline corridor while minimizing brain retraction. Also, it has the advantage of a gross total resection ranging of up to 70% in some series (36, 37).

In the present study, due to the predominance of large tumors with adherence and large invasion into adjacent vital neural structures, the surgeon took the decision to make a subtotal resection in two thirds of cases in order to avoid postoperative morbidity. The introduction of the extended endonasal endoscopic approach and the

existence of a well-trained neurosurgeon led to a reconsideration of this tactic in our hospital.

CONCLUSIONS

This study offers a detailed analysis of demographic, clinical, and surgical data showing their utility in the management decisions of patients with craniopharyngiomas. Overall, the present cohort shows strong concordance with published series, but also highlighted certain particularities that are probably related to the genetic pools of the patients studied and to the craniopharyngioma changing biology in the last years. We found out two peaks of the incidence of craniopharyngioma developing in adults, a slight predominance of affecting female patients, and some particular and rare locations of craniopharyngiomas, such as ventricle 3 and peri mesencephalic cisterns. The predominance of transcranial approaches in our cohort is comparable to many contemporary surgical series, particularly in craniopharyngiomas with large tumor volume and suprasellar or intraventricular extension.

CONFLICT OF INTEREST AND FUNDING

The authors declare that there is no conflict of interest.

This work is part of Ana-Marina Rădulescu's Ph.D. studies and was funded from the Grigore T. Popa University of Medicine and Pharmacy Iasi, Romania.

REFERENCES

1. Momin AA, Recinos MA, Cioffi G, *et al.* Descriptive epidemiology of craniopharyngiomas in the United States. *Pituitary* 2021; 24(4): 517-522.
2. Barkhoudarian G, Laws ER. Craniopharyngioma: history. *Pituitary* 2013; 16(1): 1-8 / doi: 10.1007/s11102-012-0402-z.

Demographic and Clinical Features with Surgical Considerations in Adult Craniopharyngiomas: A Romanian Neurosurgical Center Experience

3. Guinto G, Estrada E, Gallardo D, González JC, Orellana F. Craniopharyngiomas in Adults: Part I Clinical Approach. *Contemp Neurosurg* 2018; 40(6): 1-5 / doi: 10.1097/01.CNE.0000532387.80686.29.
4. Gonzalez-Meljem JM, Cao L, Apps JR, Martinez-Barbera JP. Decoding cranio-pharyngioma: From mechanisms to therapy. *Best Pract Res Clin Endocrinol Metab* 2025; 39(5): 102051 / doi: 10.1016/j.beem.2025.102051.
5. WHO Classification of Tumors Editorial Board. *World Health Organization Classification of Tumors of the Central Nervous System*. 5th Edition, Volume 6. Lyon, France: International Agency for Research on Cancer, 2021.
6. WHO Classification of Tumors Editorial Board. *WHO Classification of Endocrine and Neuroendocrine Tumors*, 5th Edition, volume 10. Lyon, France: International Agency for Research on Cancer IARC, 2025.
7. Ntali G, Shafi AM, Karavitaki N. Mortality in craniopharyngiomas: Data from the last two decades. *Best Pract Res Clin Endocrinol Metab* 2025; 39(5): 102049 / doi: 10.1016/j.beem.2025.102049.
8. Beckhaus J, Friedrich C, Müller HL. Vascular Morbidity and Mortality in Craniopharyngioma Patients-A Scoping Review. *Cancers* 2024; 16: 1099. / doi: 10.3390/cancers16061099.
9. Olsson DS, Andersson E, Bryngelsson IL, Nilsson AG, Johannsson G. Excess Mortality and Morbidity in Patients with Craniopharyngioma, Especially in Patients with Childhood Onset: A Population-Based Study in Sweden Get access Arrow. *J Clin Endocrinol Metab* 2015; 100(2): 467-474 / doi: 10.1210/jc.2014-3525.
10. Frič R, König M, Due-Tønnessen BJ, Ramm-Pettersen J, Berg-Johnsen J. Long-term outcome of patients treated for craniopharyngioma: a single center experience. *Br J Neurosurg* 2025; 39(1): 52-60 / doi: 10.1080/02688697.2023.2179600.
11. Alboqami MN, Albaiahy AKS, Bukhari BH, et al. Craniopharyngioma: A comprehensive review of the clinical presentation, radiological findings, management, and future Perspective. *Heliyon* 2024; 10: e32112. / doi: 10.1016/j.heliyon.2024.e32112.
12. Bao YY, Pan LS, Cao Y, et al. Clinical characteristics and therapeutic outcomes after endoscopic endonasal surgery for craniopharyngioma in the elderly. *J Neurosurg* 2025; 142: 464-474 / doi: 10.3171/2024.5.JNS232533.
13. Otte A, Müller HL. Childhood-onset Craniopharyngioma. *J Clin Endocrinol Metab* 2021; 106(10): e3820-e3836 / doi: 10.1210/clinem/dgab397.
14. Drapeau A, Walz PC, Jacob G Eide, et al. Pediatric craniopharyngioma. *Childs Nerv Syst* 2019; 35(11): 2133-2145 / doi: 10.1007/s00381-019-04300-2.
15. Bogusz A, Müller HL. Childhood-onset craniopharyngioma: latest insights into pathology, diagnostics, treatment, and follow-up. *Expert Rev Neurother* 2018; 18(10): 793-806 / doi: 10.1080/14737175.2018.1528874.
16. Meyer S, Shah SN, Dancel-Manning K, et al. A case-based review of adult-onset craniopharyngioma. *Front Endocrinol (Lausanne)* 2025; 16: 1527161 / doi: 10.3389/fendo.2025.1527161.
17. Simonin A, Bangash O, Henley D, Bala A. Endonasal endoscopic resection of suprasellar craniopharyngioma: A retrospective single-center case series. *J Clin Neurosci* 2020; 81: 436-441 / doi: 10.1016/j.jocn.2020.07.053.
18. Schelini JC, Cavalheiro S, Dastoli PA, et al. Endoscopic endonasal transsphenoidal approach for pediatric craniopharyngiomas: A case series. *Int J Pediatr Otorhino-laryngol* 2020; 130: 109786 / doi: 10.1016/j.ijporl.2019.109786.
19. Amayiri N, Swaidan M, Yousef Y, et al. Review of management and morbidity of pediatric craniopharyngioma patients in a low-middle-income country: a 12-year experience. *Childs Nerv Syst* 2017; 33(6): 941-950 / doi: 10.1007/s00381-017-3411-4.

20. Dandurand C, Sepehry AA, Lari MHA, Akagami R, Gooderham P. Adult Cranio-pharyngioma: Case Series, Systematic Review, and Meta-Analysis. *Neurosurg* 2018; 83(4): 631-641 / doi: 10.1093/neuros/nyx570.
21. Jha R, Shrestha R, Bhattarai SM, *et al.* Transcranial Approach in Craniopharyngioma Surgery: Results from Tertiary Care Center in Nepal. *NJN* 2024; 24(4): 25-29 / doi: 10.3126/njn.v21i4.72658.
22. Pang JC, Chung DD, Wang J, *et al.* Characteristics and Outcomes in Pediatric Versus Adult Cranio-pharyngiomas: A Systematic Review and Meta-Analysis. *Neurosurg* 2023; 92(6): 1112-1129 / doi: 10.1227/neu.0000000000002346.
23. Pires de Oliveira Neto C, Nascimento GC, Damiane SdSP, Faria MdS. Recent advances in craniopharyngioma pathophysiology and emerging therapeutic approaches. *Front Endocrinol* 2025; 16: 1562942 / doi: 10.3389/fendo.2025.1562942.
24. Kurt G, Aslan A. Craniopharyngioma. In: Feyzi Birol Sarica (Edited by). *Central Nervous System Tumors - Primary and Secondary*. London: IntechOpen, 2022.
25. Javidialsaadi M, Luy DD, Smith HL, *et al.* Advances in the Management of Craniopharyngioma: A Narrative Review of Recent Developments and Clinical Strategies. *J Clin Med* 2025; 14(4): 1101 / doi: 10.3390/jcm14041101.
26. Nielsen EH, Feldt-Rasmussen U, Poulsgaard L, *et al.* Incidence of craniopharyngioma in Denmark and estimated world incidence of craniopharyngioma in children and adults. *J Neurooncol* 2011; 104: 755-763 / doi: 10.1007/s11060-011-0540-6.
27. Zoicas F, Schöfl C. Craniopharyngioma in adults. *Front Endocrinol* 2012; 3: 46 / doi: 10.3389/fendo.2012.00046.
28. Müller HL. The Diagnosis and Treatment of Craniopharyngioma. *Neuroendocrinol* 2020; 110(9-10): 753-766 / doi: 10.1159/000504512.
29. Crowley RK, Woods C, Fleming M, *et al.* Somnolence in adult craniopharyngioma patients is a common, heterogeneous condition that is potentially treatable. *Clin Endocrinol (Oxford)* 2011; 74: 750-755 / doi: 10.1111/j.1365-2265.2011.03993.
30. Haghhighatkah HR, Sanei Taheri M, Haghghi M, Shahzadi S, Birang Sh. Imaging of Monstrous Craniopharyngioma: A Pictorial Essay. *Iran J Radiol* 2010; 7(2): 79-89.
31. Pascual JM, Prieto R. Craniopharyngioma and the Third Ventricle: This Inescapable Topographical Relationship. *Front Oncol* 2022; 12: 872689 / doi: 10.3389/fonc.2022.872689.
32. da Cunha Ferreira Neto O, Mendes Braun D, Araruna Dias AJ, *et al.* Third Ventricle Craniopharyngioma. Intraventricular Tumor: A Case Report and a Brief Literature Review. *J Neurol Surg Rep* 2022; 83(2): e39-e43 / doi: 10.1055/a-1830-2236.
33. Randhawa AS, Narad S, Nimmakayala S, *et al.* Rare case of a craniopharyngioma in the prepontine cistern: A case report. *Surg Neurol Int* 2025; 16: 404 / doi: 10.25259/SNI_802_2025.
34. Sohn CH, Baik SK, Kim SP, Kim IM, Sevick RJ. Craniopharyngioma in the temporal lobe: a case report. *Korean J Radiol* 2004; 5(1): 72-74 / doi: 10.3348/kjr.2004.5.1.72.
35. John AA, Marsh H, Rossettie SS, *et al.* Ectopic craniopharyngioma of the orbit: illustrative case. *J Neurosurg Case Lessons* 2022; 3(6): CASE21544 / doi: 10.3171/CASE21544.
36. Baldauf J, Hosemann W, Schroeder HWS. Endoscopic Endonasal Approach for Craniopharyngiomas. *Neurosurg Clin N Am* 2015; 26: 363-375 / doi: 10.1016/j.nec.2015.03.013.
37. Aragón-Arreola JF, Marian-Magaña R, Villalobos-Diaz R, *et al.* Endoscopic Endonasal Approach in Craniopharyngiomas: Representative Cases and Technical Nuances for the Young Neurosurgeon. *Brain Sci* 2023; 13(5): 735 / doi: 10.3390/brainsci13050735.